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elected President, an informal meeting of the members and fellows of the society took place in order to bid him farewell.

In the spring a small committee was formed to collect funds for the presentation portrait. Mr. Lander was the artist selected, and this portrait, with the surplus funds, was given to Major Darwin on behalf of his friends by one of the Vice-Chairmen, Prof. E. W. MacBride, F.R.S. In a short speech he expressed strikingly the feeling of dismay with which eugenists had anticipated this moment and the very strong affection felt for their leader by those who had worked under him. Major Darwin had been President of the society for 18 years out of the 20 years of its existence.

Major Darwin made a most charming speech of thanks and alluded to the progress made in the 20 years of the society's existence. In early days those who took human heredity seriously as a factor in social affairs, were generally regarded as faddists and cranks. This phase is now past and eugenists rank not only as serious scientists but as promoters of social progress who must be reckoned with. Major Darwin referred to the large number of old friends who still were helping the society's council—Mrs. Rolfe, who proposed the formation of the Eugenics Education Society (as it was at first called), the Dean of St. Paul's, Lady Chambers, Doctor Fisher, who joined the society as an undergraduate, and Dr. C. J. Bond, who is doing much for the society as Chairman of some special committees. In thanking these friends, the President referred particularly to Prof. MacBride's courage in being the first Fellow of the Royal Society to associate himself with the movement. It was comforting to all to have Major Darwin promise that, as Honorary President, he would continue to give help and counsel when called upon. He spoke with great hopefulness of the future and finally promised to give the Galton Lecturo this year as his parting address.

GALTON SOCIETY.

The sixty-ninth meeting of the Galton Society was held on October fifth at the American Museum of Natural History.

Present: C. C. Brigham, C. B. Davenport, W. K. Gregory, H. H. Laughlin, G. G. MacCurdy, J. H. McGregor, F. Tilney, T. W. Todd, C. Wissler. Guests of the Society were Dr. Felix Bernstein and Dr. Dudley J. Morton.

After a brief transaction of business, the Chairman called the attention of the Society to an important work on race crossing by Dr. Lotsy of Holland, and the Secretary added a notice on the extremely interesting article by the Chairman, Dr. Davenport, on his investigations of race crossing in Jamaica.

The Chairman then introduced Professor Tilney, who spoke on "A Comparative Sensory Analysis of Helen Keller and Laura Bridgman."

After a short discussion of this paper the meeting adjourned until the first Friday in November.

A Comparative Sensory Analysis of Helen Keller and Laura Bridgman.

Frederick Tilney.

Several years ago in an address to the American Neurological Association, I ventured the statement that the human race had probably developed no more than one-fifth of its potential brain power. I cited the case of Helen Keller who, though blind and deaf, has become a distinguished personage. Subsequently I had the privilege of making a study of Miss Keller and have assembled the results of this study and of a comparative sensory analysis of Helen Keller and Laura Bridgman in their bearing upon the potential development of the human brain.

My problem was to estimate the value of the senses by which Helen Keller gained an impression of her environment. She depends primarily upon her sense of touch. Since infancy she has been blind and deaf. Her sense of smell is keen and very valuable to her in making contact with the world. Taste, likewise preserved, has also influenced her development, though less than has her sense of smell.

Miss Bridgman's sensory avenues were even more limited. Her sight and hearing were destroyed in infancy and smell and taste were of little use to her.

Helen Keller's sensory equipment was analyzed and compared with that of normal adults of like age. Although her extremely sensitive olfactory sense has helped her intellectual growth, yet when tested objectively her sense of smell shows nothing above the normal average. Nor is any advantage evident in the fundamental organization of her taste sense. As regards sight, she is totally blind, with neither light nor object perception. She is also completely deaf, there being no bone or air conduction in either ear.

When tested for light touch sensation, Miss Keller corresponds strikingly to the normal. Dr. G. Stanley Hall believed that Laura Bridgman had a two-point recognition much greater than the average. My experience with Miss Keller, however, raises a question concerning Dr. Hall's conclusion, for Helen Keller's figures correspond closely with those of Laura Bridgman and Miss Keller's two-point recognition is similar to the normal. Miss Bridgman could detect a distance of .5 millimeter on the tip of her tongue; so also can Miss Keller, and, indeed, many normal persons. Miss Keller can find the eye of a needle applied to the tip of her tongue and succeeds in threading it after a period of concentration and patience. Concentration and patience are, I believe, the secret of much of her sensory superiority.

Two-point recognition belongs to the higher orders of sensory synthesis and is largely conditioned by training. Miss Bridgman had developed great facility in sewing. The continued use of a fine instrument like the needle would naturally train this recognition to a high degree. Reading Braille would not have this same effect, for the Braille points are relatively coarse and the intervals between them not small. Miss Keller reads and uses the typewriter extensively, but does less needlework than Laura Bridgman did. Such special training in the associations of this complex sensory synthesis may account for the advantage Laura Bridgman is said to have manifested over the normal average.

In all the tests made of touch localization, of cutaneous sense by electric currents, of pressure and of temperature sense, Miss Keller corresponds to the average. Her vibratory sense is extremely important in conveying information to her of much that goes on in her environment. She recognizes stamping on the floor in a room below her, distinguishes individuals by their tread, differentiates between implements used in the house, such as saws, planes and hammers; seated in her room she can tell when an airplane is passing near her home. With her hands and a specially constructed loud speaker she "listens" to the radio, and although not able to interpret spoken language in this way, she keenly appreciates music. By distinguishing the vibratory effects of articulation she follows conversation with ease, placing her hand upon the speaker's face with her thumb resting on the larynx, her middle finger on the lips and her index finger on the ala of the nose.

Three methods were employed to test her vibratory sense: Tuning forks, a pallaesthesiometer especially devised for her by Mr. Keith Henney, which records on a scale of radio cycles, and a loud speaker mechanism attached to the pallaesthesiometer for examining vibratory sensation over large body areas. In all these tests Miss Keller's vibratory sense

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December, 1928

HUMAN BIOLOGY.

Raymond Pearl, as editor, announces the appearance of a new quarterly magazine, *Human Biology: A Record of Research,* the first issue of which will appear in January, 1929. Curt P. Richter and John R. Miner are assistant editors, and Blanche F. Pooler, managing editor. The advisory board are: Charles B. Davenport, S. R. Detwiler, E. M. East, Eugen Fischer, Corrado Gini, Major Greenwood, Shinkishi Hatai, Aleš Hrdlička, Ernst Kretschmer, H. Lundborg, Bronislaw Malinowski, D. Peyrony, P. Rivet, Adolph Schultz, John B. Watson and Clark Wissler.

The announcement states: ''*Human Biology* is established to serve as a medium for the publication of the results of original research in any field of human biology, including physical and general anthropology, anthropometry, vital statistics, human heredity and eugenics, prehistory, human anatomy, sociology, constitutional pathology, and psycho-biology, the only requirements being that the essential point or points of any acceptable article must have general biological interest and significance, and that the article shall be written with some attention to literary form and unity, so that the reader may, without undue effort, get the point. Entire freedom, within very wide limits, will be given to contributors in the matter of length of articles and their suitable illustration.

''English will be the sole language of the journal. Acceptable contributions in other languages will be translated into English before printing. There will be no reviews, the entire available space being devoted to the publication of original contributions, except that in each number there will be a list of new books and memoirs which have been received at the Editorial Office. In some measure these lists will serve as current bibliographies.''

Eugenicists welcome *Human Biology* because, among other purposes, it will serve as an archive journal for researches in eugenics.

The subscription price is $5.50 per year.

ANIMAL BREEDING.

Leon J. Cole, Professor of Genetics in the University of Wisconsin, announces a new magazine, *Animal Breeding,* the first issue of which will be published in January, 1929. The editorial board are: W. A. Cochel, W. C. Coffey, L. J. Cole, editor, W. L. Gaines, F. G. King, W. M. Marsh, E. N. Wentworth; and the associate editors are: F. A. E. Crew, L. C. Dunn, C. H. Eckles, J. W. Gowen, W. A. Lippincott, J. L. Lush, H. C. McPhee, Hans Nachtsheim, Raymond Pearl and Sewall Wright.

The magazine will be published six times a year and will cover the following subjects: genetics of domesticated animals, principles and practice of breeding, physiology of reproduction, vital statistics of animal industry, methodology, editorials and reviews. It is anticipated that there will be about 500 pages to the yearly volume. The subscription price in the United States and Canada is $4.50 per year.

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corresponds to that of the normal average adult. Tests of motion sense show that she is, if anything, less acute in recognizing motion than the average. Nor has she unusual capacity in posture sense. Her balance sense is perfect despite the absence of response from the semicircular canals of either side to cathodal or anodal stimulation of the Hitzig tests. In testing the hurt sense by pin-point, steady pressure, sudden compression, extremes of temperature, vibrations below 100 oscillations, overextension and overflexion of joints, Miss Keller's discomfort is the same as in normal controls. If this sense is actually less acute than the normal, the difference may be due to a stoicism in her philosophy which permits her to endure pain with more fortitude than is true of average individuals.

Most of our contacts with the world depend upon combinations of the several contact components. These elements enter into a sensory composite giving a picture of the situation examined; and a photographic memory of these conditions must be made and retained in the brain. Correlation with other types of sensation is essential for proper object association, recognition and naming. To recognize the texture, size and shape of objects through the sense of touch requires composite associations of sensory elements. One important composite is stereognosis, the recognition of objects by palpation. Miss Keller's stereognosis is much above that of any normal individual I have ever tested.

It thus appears that her sensory organization for the primary conduction of afferent impulses is not above the average. Her sensory supremacy is entirely in the realm of intellect. She has developed a richness of association far surpassing the average. Indeed, hers is an exceptional capacity even in the class rated as intellectual.

Although impossible to express in measurable terms, as in Helen Keller's case, the result of Laura Bridgman's sensory tests, the several sensory components were studied by Dr. Hall, whose summaries furnish a basis for this comparison. In Laura Bridgman the olfactory sense was defective and of little value in her development. Vision, as such, contributed no more to her than to Helen Keller. In one detail alone the structural conditions in this sensory organization in the two women differed. Laura Bridgman retained her eyes throughout her life. She had a wonderful sense of direction attributable, perhaps, to the fact that she possessed retinae, although they were devoid of visual function. Miss Keller's lack of sense of direction may be ascribed to the fact that she has long been deprived of her retinae.

Laura Bridgman's gustatory sense was much impaired. The tests of hearing seem to show a complete loss of audition. Her sense of touch was much greater than the average, her stereognosis parallel with that of Miss Keller. Though her facial sense was not well developed, yet apparently her hands and face were the most sensitive parts of her body. She was not remarkably sensitive to temperature, but was extremely responsive to vibration, although nothing in Dr. Hall's reports warrants the belief that she had any superiority in the organization of primary pathways for vibratory sense. Judged by her general capabilities and skilled acts, motion and position senses were presumably normal. She had a pronounced sense of balance. Her sensitiveness to heat, pressure and electric stimulation was below the average. As to visceral sensation, Dr. Hall states that she never developed heart or liver consciousness.

The differences between Miss Keller and Miss Bridgman seem to be in direct proportion to the methods of their training. Laura Bridgman's instruction depended upon improvised innovations and experiments often too narrowly conceived. Miss Keller's exceptional teacher, Mrs. Macy, gave to her every experience a pedagogic value and taught her to capitalize every opportunity for learning from impressions entering her sensorium. Miss Bridgman's education ceased when she was twenty. Miss Keller's continues to the present day. She has had a greater variety of interests and more extensive contacts. Laura Bridgman's accomplishments, though outstanding in her day as the first notable instance of this kind, were of a simple order. Miss Keller has achieved distinction as an authoress, a lecturer and a thinker. Laura Bridgman was capable of about fifty vocal sounds, few of which were recognizable words. Miss Keller's speech, though lacking inflection, is intelligible. She interprets spoken words, an accomplishment never possible to Laura Bridgman. Both possessed great manual dexterity; if difference exists between them in this regard, it slightly favors Miss Keller.

In the development and utilization of the senses the two women show a striking similarity. Compared with normal adults they both illustrate the point that peripheral receptors of the general sensory apparatus exhibit no compensatory development in those deprived in infancy of sight and hearing. The fundamental organization of the senses which they retained intact has no advantages over the normal adult. Their primary sensory mechanisms were no more efficient than the average, yet in comparative intelligence ratings they would stand higher than the average run of mankind. Compared with those who have benefited by education, through high school grades, Laura Bridgman might show certain intellectual inferiorities, but her advantages in other regards would probably offset these. Helen Keller would stand far above such a rating. They were largely dependent upon one sensory area of the brain for their intellectual achievements. With this small portion of the brain in active commission they made adjustments to life at least equal to the average. This must mean that the average brain, with all parts working, develops but a fraction of its potential power.

Apparently, then, man has the mechanism for more adequate adjustment to life. He needs only the determination to develop its capacity. Social and intellectual distinction depends upon the brain's ability to elaborate impressions received by sensory pathways. The associational expansions within the brain account for the degree of its power. One may say that the achievements of Miss Keller and Miss Bridgman were the results of compensation and that with no demand for such compensation no associational expansion occurs. To maintain that expansion in the powers of the brain is compensatory, affirms that the brain is capable of further development. Nor need one rely upon theory to uphold this postulate. The brain of Laura Bridgman, studied by Dr. Donaldson, showed conspicuous defects in those areas upon which little functional demand was made. The parietal lobe, area of touch sensation, particularly for the hand and face, was well developed.

Expansions in the brain in response to functional demand would seem to require a physical basis. They are probably not due in great measure to increase in cortical cells whose number is determined in late fetal stages. Further brain development depends rather upon connections established between nerve cells by means of nerve fibers. Many facts indicate that such connections are made only when called for by needed communications. One result of this functional call is the appearance of an insulating substance, called myelin, on the nerve fibers, which makes them better conductors of nerve impulses. Donaldson expressed the opinion that expansion of the brain is due to increased medullation, that is, increased deposit of myelin on the nerve fibers. If this be so, the chief factor favoring the deposit of myelin seems to be the functional use of the brain areas. When nerve fibers are continuously called upon to convey impulses, they tend to acquire their insulating sheaths, that is, become myelinized.

Experiments indicate a progressive increase in the amount of myelin in the brain in direct proportion to the increase of mental powers. The degree of myelin probably varies greatly in different individuals. In certain diseases and in feeble-mindedness it is low. The greatest brain efficiency depends apparently upon the ultimate myelinization of the largest number of association fibers within the brain.

The cases of Laura Bridgman and Helen Keller illustrate how one area of the brain may be expanded to counteract deficiencies in other areas. Helen Keller shows the resultant expansion in understanding and knowledge when the brain is properly importuned to develop them. Many brains could be made more efficient by pursuing proper methods of development. The difficulty is not in the brain's potential power to respond, but rather in the general lack of desire to demand the improvement.

Pessimistic observers doubt that the ascendant elements in the human race will ever reach a higher plane. Indeed, with regard to the historic period it may seem that mankind has stood still intellectually. We lead about the same lives as did men 300,000 years ago. Human behavior and human relations are but little changed. Yet brain development, like all other development, follows the laws of evolution. Into this evolutionary process during the past half century has come a new element which may have far-reaching consequences. Intelligent persons now recognize that there is such a thing as evolution. Being conscious of this fact they undoubtedly will direct their attention to its processes and its underlying causes. Much may be expected from such efforts both to increase the understanding of our mechanisms and to improve their capacities. Another encouraging aspect is disclosed by a study of the prehistoric human brain which points to a steady progressive development in the organ from those early times up to the present. Thus there is reason to believe that the brain of man today represents some intermediate stage in the ultimate development of this master organ of life. As a race we appear to have evolved but a fraction of its power. The problem before us is how to put it to better use. This problem may be solved only by the development of that comprehensive science which will eventually supply an adequate knowledge of all the mechanisms underlying the control of human behavior.

Discussion.

Dr. Davenport and Professors Brigham, Gregory, MacCurdy and McGregor took part in the discussion. In reply to a question, Professor Tilney said: "In her adjustment to life, Laura Bridgman stood much above the ordinary grade. I would say that she would compare favorably with a high school graduate. While she might be deficient in some special trait, yet in others she would make up for this.

"In Helen Keller's case, she can do so many things and do them so well that I would rank her at least as high as the highest grade of those of college education. She correlates and compares her impressions.

"Both women have one sensory area—touch and its connections. So I maintain that other sense areas can be built up in the same way. If this be a compensatory development—because compensation depends upon physiological use—we have a mechanism within ourselves to develop our brains. It is a question whether we will ever be able to get the degree of concentration that is necessary for this, as everything in life trends away from concentration toward haste and speed.

"I do not think it is a matter of getting more cells in the brain. The actual endowment of cells in the cortex is the same at birth as later in life. It depends on the myelin sheathing of the nerve fibers. It is a striking fact that the amount of myelin increases from birth up to the age of forty years.

"We are influenced by so many unfavorable factors in modern life that I am not sure that man is not retrograding."

Professor McGregor suggested that Miss Keller's mental superiority might be due in part to the absence of heterogeneous stimuli.

Professor Gregory mentioned Houdini as a remarkable example of what could be accomplished by training in sensory discrimination.

Professor McGregor asked whether Miss Keller's dreams revealed any sense perceptions other than those of touch and Professor Tilney replied that he hoped to carry out this side of his investigations later.

CURRENT PERIODICALS.

The October number of the *Archiv für Rassen- und Gesellschafts-Biologie* opens with an article by Gerhard Hooff on the heredity of congenital hip dislocation. Among 3,000 cases there are 6 times as many female as male infants who are affected and rather more on the left side than the right. Of 932 families considered, 20 per cent. show a repetition in the family. Irregular dominance in inheritance is indicated. Essentially there seems to be a disharmony of certain hereditary elements which have been brought together in race mixing. A family of bleeders is described by Dr. M. Madlener in which 3 bleeders have also red-green color blindness and in which appears a hemophiliac girl whose father was a bleeder but in whose mother's family no bleeders were found. Prof. E. Rüdin contributes a lecture on the production of mental disturbance in the progeny, which gives the biometric predictions of the chance of relations of affected individuals being affected. Dr. Fritz Kern sets forth his theory of the Europaoids, consisting of 9 races derived from 5 chief stems and repels Gunther's criticisms. Lenz and Verschuer propose a method of estimating the part played by heredity and environment on variability. Weissenberg gives 10 sundry pedigrees; and Fetscher one of multiple birth. Koehne gives evidence of many black haired persons in primitive Germany. The usual reviews are published.

NOTES AND NEWS.

Miss Emily F. Robbins, who has served as secretary in important eugenic conferences, is now press representative of the Gorgas Memorial, Institute of Tropical and Preventive Medicine, Washington, D. C.

In Batavia, Dutch East Indies, there has been established, since 1927, a eugenical society of approximately 200 members. This edits a quarterly review entitled "Ons Nageslacht." The secretary of the society is Dr. Schouwersburg.

The final record of proceedings of the first Pan-American Conference of Eugenics and Homiculture has now been printed and can be obtained from the Pan-American Office of Eugenics and Homiculture, Ministry of Sanitation, Havana, Cuba.

A communication from Geheimrat San.-Rat Dr. Albert Moll, president of the International Society for Studies in Sex, states that the plan to hold the Second International Congress in Rome must be abandoned because of limitations in scientific freedom in Italy. It is expected that the Congress will not be held in the spring of 1929.

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1928. (Changes in 1927. Divorce rate increased, farm family slowly decreased. Tendency in several states to make marriage more difficult. Increased interest in parental education. Popular interest in Lindsey's companionate marriage.)

2394 Rich, Margaret E., Ed. Family life today. Boston: Houghton Mifflin Co. 1928. $2.50. (Papers given at the conference held in Buffalo, N. Y., in 1927, under the auspices of the Am. Assn. for Organizing Family Social Work.)

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See also 2385

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2396 Pearl, R. The rate of living. New York: A. A. Knopf. 185 pp., 1928. (Statistical study of the results of the "integrated forces of mortality and of natality" as shown in the growth and decline of an annual group of fruit flies.)

MIGRATION

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2398 Kolb, L. Mentally defective aliens as related to immigration. Proc. Am. Assn. for Study of the Feeble-Minded. *33*: 191–203. 1928. (Few idiots and imbeciles sail for United States: but thousands of low grade morons are landed.)

2399 Laughlin, H. H. The eugenical aspects of deportation. Hearing before Com. on Immigr. and Nat. House Rep. (No. 70, 1. 4) 83 pp. 19 (Digest of laws; practice of stat state statistics.)

RACIAL ANTHROPOLOGY

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2401 Rolleston, Sir H. Some diseases in the Jewish race. Bul. Johns Hop. Hosp. *43* (3): 117–139. Bibl. 1928. (Amaurotic family idiocy, thrombo-angiitis obliterans, Gaucher's and Niemann's diseases, diabetes mellitus, pentosuria, obesity, acromegaly, hereditary haemoptysis, malignant disease, tuberculosis, alcoholism.)

2402 Young, M. The problem of the racial significance of the blood groups. Man *28* (10): 171–176. Tab., bibl. 1928. (Present knowledge indicates small warrant for believing that bloo grouping will provide a satisfactory basis for the classification of racial types.)

Race Crossing

2403 Davenport, C. B. Race crossing in Jamaica. Scient. Mo. *27* (Sept.): 225–238. 11 figs. 1928. (Hybrids between black and white are better endowed than whites in music, simple arithmetic and resistance to certain diseases, but an excessive number of them are ineffective people because disharmoniously put together.)

2404 Fantham, H. B., and Annie Porter. Notes on some cases of racial admixture in South Africa. So. African J. of Sci. *24*: 476–485. 1927. (Eugenics and Genetics Com'tee So. Afric. A. A. A.) (9 hybrid families described. Tendencies to tuberculosis, physical disharmonies and emotional instability.)